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NOTES ON GEOGRAPHIC DISTRIBUTION

Geographic range extension to Wyoming, USA, for *Paraleptophlebia praepedita* (Eaton, 1884) (Insecta: Ephemeroptera: Leptophlebiidae)

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ABSTRACT: New distribution data from Carbon Co., Wyoming, extend the USA range of *Paraleptophlebia praepedita* (Eaton, 1884) westwards, with the nearest records being from eastern Iowa, Minnesota and Missouri. The new record is based on male adults collected from riparian vegetation. *Paraleptophlebia praepedita* is one of at least five predominantly eastern North American aquatic insect species with disjunct populations in the uranium mining areas of the western North Platte River drainage.

Eaton (1884: 99) described *Paraleptophlebia praepedita* (Eaton, 1884), (Ephemeroptera, Leptophlebiidae) based on the male adult stage from Dedham, Massachusetts; Spieth (1941) subsequently verified the type concept and designated a lectotype. Needham (1905: 50) provided the first larval description based on reared material from Illinois.

The male adult is distinguished from other North American congeners by the combination of having the middle abdominal segments predominantly brown; and by having each penes lobe elongate, nearly as long as the forceps, and with a terminal nipple and a rounded-tipped reflexed spur that curves slightly outward and upward (Traver 1935; Burks 1953). The larva is distinguished from others by the combination of having tuskless mandibles that are not enlarged, gills that are divided near their bases, the combined length of maxillary palp segments 2 + 3 nearly subequal to segment 1, legs without distinct banding, gills without prominent lateral setation, and abdominal sterna with dark brown lateral coloration that usually contrasts the medial coloration (Traver 1935). Zhou *et al.* (2009) provided DNA barcode data for molecular identification of this species.

Paraleptophlebia praepedita has a wide distribution in eastern North America, with incursions into central and western Canada (Figure 1). It has been reported from the Canadian provinces (McCafferty and Randolph 1998) of Alberta (Clifford and Boerger 1974), Manitoba (McDunnough 1925a; Gyselman 1980; Zhou *et al.* 2009, 2010; Webb *et al*. 2012), Nova Scotia (Jacobus and McCafferty 2001a), Ontario (Clemens 1915; McDunnough 1925a; Ide 1930; Mathers 1978), Quebec (McDunnough 1925a, c) and Saskatchewan (Lehmkuhl 1976), and from the USA states of Alabama (Harris *et al.* 1996; McCafferty *et al.* 2010), Arkansas (Cather and Harp 1975; McCafferty *et al.* 2010), Illinois, Indiana, Michigan, Ohio (Randolph and McCafferty 1998), Iowa (Klubertanz 1995; McCafferty *et al.* 2003), Massachusetts (Eaton 1884), Minnesota (Lager *et al.* 1982), Missouri (Sarver and Kondratieff 1997), New York (Jacobus and McCafferty 2001b), West Virginia (Faulkner and Tarter 1977; McCafferty *et al.* 2010) and Wisconsin (McCafferty 2009). McCafferty *et al.* (2012: 242) inadvertently listed *P. praepedita* for Colorado. Therefore, this report should be disregarded, because they provided no substantiating data for this report and no species account for it in the Intermountain West region (McCafferty 2000).

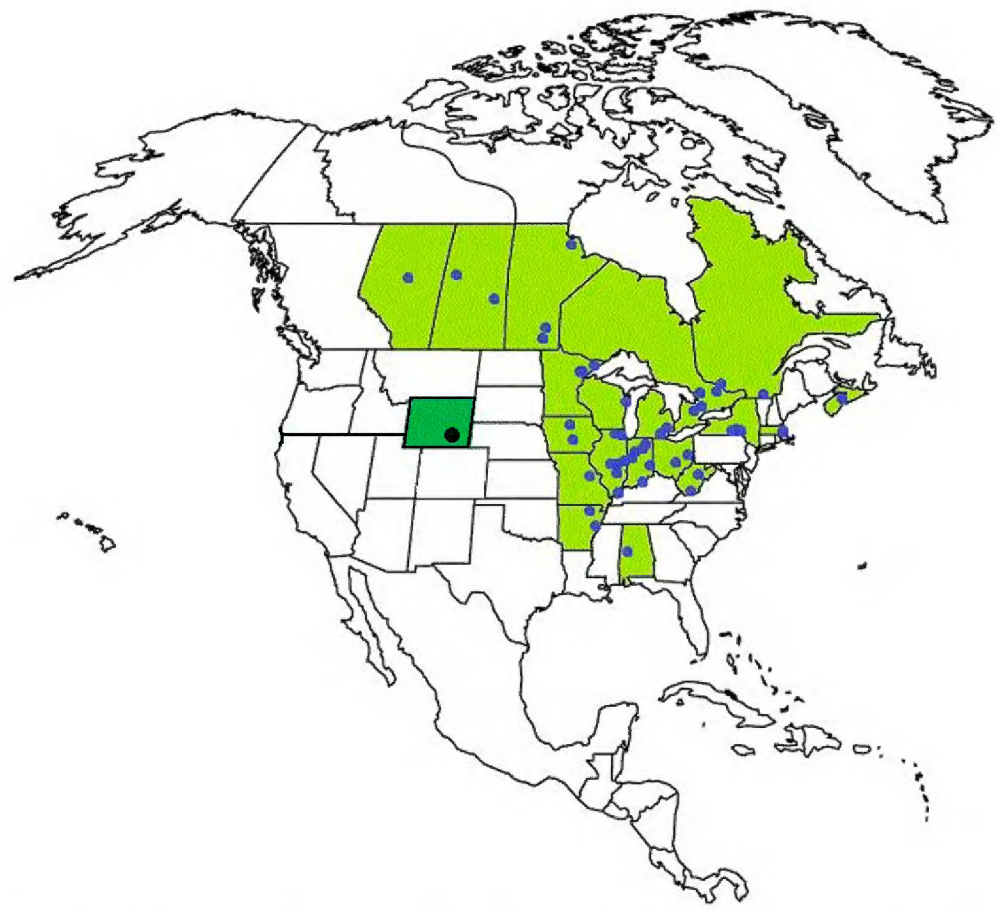

FIGURE 1. Distribution map for *Paraleptophlebia praepedita*. States and provinces home to previous records shaded with light green; Wyoming indicated with dark green. Previous record locales indicated with dark blue circles. New Wyoming record locale indicated by black circle.

Recently, *P. praepedita* was collected in eastern Wyoming. The specimens were found perching on streamside vegetation. They were placed in plastic bags and returned to the laboratory for fixation, preservation, labeling, identification and morphological scrutiny. The

finding of this species in Wyoming marks a significant new distribution record of the taxon (Figure 1), extending its USA range west, with the nearest records from Iowa, Minnesota and Missouri (Lager *et al.* 1982; Klubertanz 1995; Sarver and Kondratieff 1997; McCafferty *et al.* 2003). New data are as follows: USA, Wyoming, Carbon County, Muddy Creek at State Route 487, 42°12'39.06" N, 106°15'26.496" W, July 2010, T. Schmidt, two male adults, voucher numbers 12LJ01, 12LJ02 (deposited in the C. P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado, USA).

Muddy Creek is a drainage unit of the Shirley Basin, an area typical of the eastern high Wyoming plains with moderate elevation changes. Elevation at the site of the collection was approximately 2,070 m. The climate is considered arid to semi-arid, with low annual precipitation and a frost-free growing season of 90 to 110 days. Temperatures are moderately warm during the summer and cold in the winter. Extreme fluctuations in temperatures from day to day and in annual precipitation from year to year are common (Knight 1996). The Shirley Basin is a southward extension of the Wind River Basin and lies between the Sweeter Arch and the Laramie Range. Stream substrate reflects the major bedrock units of the Wind River and White River shale formations (Knight 1996). This area is well known for uranium mining (Melin 1964).

Paraleptophlebia praepedita is a third mayfly species to demonstrate an atypical distribution pattern that includes much of central and eastern North America, with a disjunction in the North Platte Drainage in Colorado or Wyoming. Others include *Heterocloeon frivolum* (McDunnough, 1925b) (Baetidae) and *Rhithrogena manifesta* Eaton, 1885 (Heptageniidae). Durfee and Kondratieff (1994) indicated that other primarily aquatic insects follow this disjunct pattern, including, for example, *Taeniopteryx parvula* Banks, 1918 (Plecoptera: Taeniopterygidae), and *Pycnopsyche guttifer* (Walker, 1852) (Trichoptera: Limnephilidae) (Ruiter and Lavigne 1985; Kondratieff and Baumann 1988; Ruiter 1990). The Platte subsystem once may have acted as a conduit from more eastern regions of the Missouri River Drainage for these species (McCafferty *et al.* 2012).

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